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Naval Aerospace Medical Research Laboratory
Pensacola, Florida

13 March 1973

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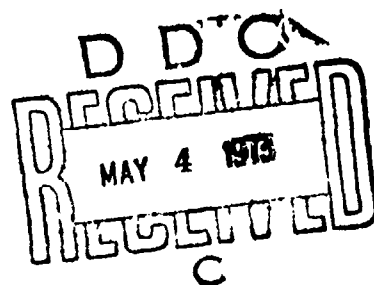
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Richard J. Brown, James L. Kupper, and Walter P. Trevethan

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Approved by

Ashton Graybiel, M. D.
Assistant for Scientific Programs

Released by

Captain N. W. Allebach, MC, USN
Officer in Charge

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Naval Aerospace Medical Research Laboratory
Naval Aerospace Medical Institute
Naval Aerospace and Regional Medical Center
Pensacola, Florida 32512

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SUMMARY PAGE *

THE PROBLEM

Disease surveillance in animals closely associated with man provides important zoonotic sentinel information. Often animals are accurate models of response to environmental factors that also effect man. This is especially true and of even greater significance in recent years with the ever increasing list of viral and chemical carcinogens.

Tabulation and study of animal tumors provide excellent training and review in general comparative pathology for those pathologists working almost exclusively in primate pathology. Even more importantly, however, a broad spectrum of animal pathology is required to meet the residency requirements of the American College of Veterinary Pathologists. The usual laboratory comparative pathology cases (rats, mice, nonhuman primates, rabbits, etc.) at the Naval Aerospace Medical Research Laboratory, plus the usual canine and feline material from Northwest Florida permit military veterinarians assigned to the Naval Aerospace Medical Research Laboratory to count this time toward board certification in pathology.

This NAMRL Special Report is a summary of the neoplastic cases observed at this institute from July 1968 until February 1973.

FINDINGS

One hundred and fifty neoplastic cases from Northwest Florida were reviewed. Ninety-one (60.7%) were benign and 59 (39.3%) were malignant. Dogs accounted for the majority of the tabulations. The skin was the most common site of both malignant and benign neoplasms. The occurrence of lymphosarcoma in the dog was higher than reported as average in the United States.

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*The animals used in this study were handled in accordance with the "Principles of Laboratory Animal Care" established by the Committee on the Guide for Laboratory Animal Resources, National Academy of Sciences, National Research Council.

INTRODUCTION

Animal disease surveys provide valuable information to the veterinary medical practitioner. Domestic animals share with their masters the same environment and, thus, may also serve as ecological monitors for man. Since animals are often accurate models of human response to environmental factors, there can be particular significance in studying diseases of those animals most intimately associated with man.

Tabulation and study of the natural occurrence of cancer in animals closely associated with man in a geographic area is a worthwhile endeavor for several reasons. Lesions from animals in a concentrated area of people provide important zoonotic sentinel information. Review of canine and feline histopathological material provides an excellent source of training and review in general pathology for pathologists working almost exclusively in primate pathology. Household animals living in close association with man share the same environmental exposures. The shorter life span and more rapid rate of aging of animals may well disclose the presence of environmental neoplastigenic factors. When and if such neoplastigenic environments are suspected in domestic animals, these can be quickly followed up with experimental studies in animals phylogenetically more closely related to man, i.e., nonhuman primates. Such an approach is valid since many of the types of tumors in domestic animals have similar histological and biological behavior as in man.

A greater awareness of cancer in the past three decades, coupled with the tremendous increase in the number of small animal practices, has stimulated a valuable accumulation of previously unavailable data on animal cancer cases for epidemiologic and morphologic study.

Study of cancer in man has accelerated in the past decade because of adequate pathology services, mandatory death recordings and more recently, computer data accumulations. Animal deaths are not systematically recorded, except at university teaching hospitals. Meaningful tabulation of field surveys compiled by veterinary pathologists utilizing tissue submitted by nearby practitioners is often hampered by submission of tissue without information as to age, breed, sex, or even species of the animal.

The largest animal tumor registry today is located at the Armed Forces Institute of Pathology (1). Here, representative tissues of virtually all animal tumor types are reviewed, tabulated and stored. Retrieval by computers is now available. The World Health Organization has recently designated the Veterinary Pathology Division of the Armed Forces Institute of Pathology as an International Reference Center for Comparative Oncology (6). Accordingly, a new Registry of Comparative Pathology has been established (2).

Only a few reports to date have addressed themselves to the occurrence of animal cancer in specific geographical areas. Dorn reviewed animal cancer in Alameda and Contra Costa counties in California (5). Squamous cell carcinoma of the horn of cattle is described in specific areas in India (7).

The data in this report were collected from animal tissue used to comply with the residency training requirements of the American College of Veterinary Pathologists. Veterinarians seeking board certification must complete several years of exposure to a broad spectrum of animal pathology material. The usual laboratory animal pathology cases (rats, mice, nonhuman primates, rabbits, etc.) at the Naval Aerospace Medical Research Laboratory plus the dog, cat or other material from local veterinary medical practitioners help to meet these requirements. As a result, Army and Air Force veterinarians assigned to this Naval Medical Laboratory at Pensacola are able to count this time toward board certification in pathology.

MATERIALS AND METHODS

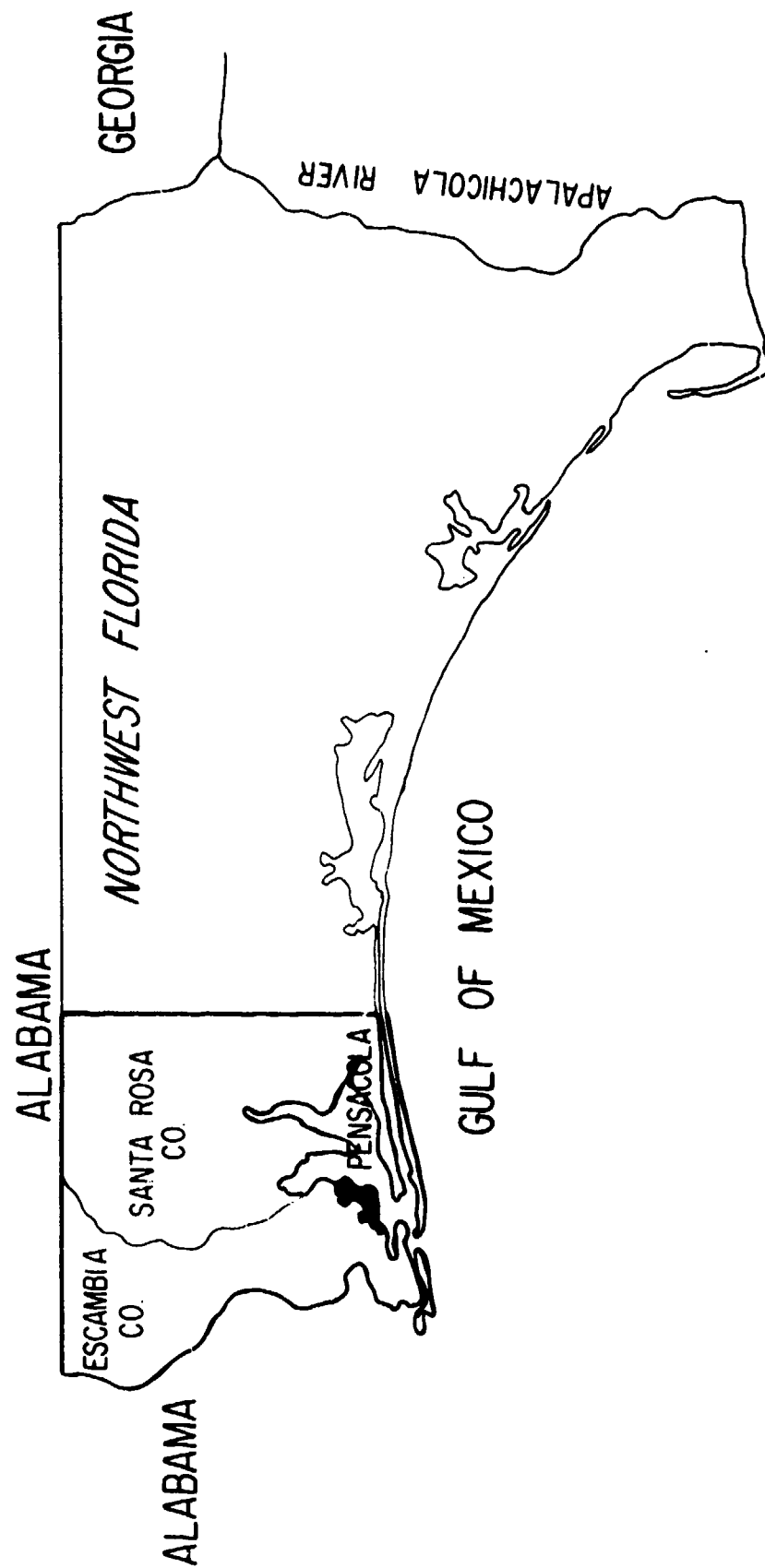
Northwest Florida includes generally the area in Florida west of the Apalachicola River. Ninety percent of our cases were submitted from the greater Pensacola area located within Escambia and Santa Rosa counties (see map). This area has a human population of 243,075. The animal population of this area is estimated to be 108,000 dogs and cats, 5,500 horses and 37,000 other animals.

The acquisition of tissue was on an informal basis. Several of the contributing practitioners routinely brought tumor specimens to Veterinary Medical Association meetings. Others would occasionally drop specimens by the home of the pathologist or histotechnician. During the lunch hour the Army and Air Force veterinarians would occasionally drive to nearby hospitals to pick up specimens. Sunday drives also served as pathology pickup runs. Only a few cases were received the first two years. A gradual increase in cases was noted each year, due to increased practitioner awareness of the importance of pathology support.

Specimens were usually fixed in ten percent neutral buffered formalin. Tissue was processed on a space available basis with a priority below all official research project tissue. Specimens were embedded in paraffin, sectioned at 7 microns and stained with hematoxylin and eosin. Special stains were utilized when necessary, i.e., to demonstrate mast cell granules or rule out possible infectious agents. The tumors were classified and coded in accordance with the method of the Armed Forces Institute of Pathology, using morphologic and histologic diagnosis, anatomic site and species. The diagnosis was recorded on the outside of each individual case folder and the report was made to the contributor by telephone and mail. An effort was made to avoid coding a second identical tumor reoccurrence from the same animal.

RESULTS

Approximately 750 submissions were received from the study area during the period July 1968 to February 1973. Private veterinary medical practitioners furnished virtually all of the cases. Approximately 600 submissions were non-neoplastic and are not considered in this report. Of the 150 neoplastic submissions 91 (60.7%) were benign and 59 (39.3%) were malignant. Dogs accounted for the majority of the submissions



with 137 cases. Figure 1 illustrates the major anatomic sites of all canine tumors. Of these tumors 39.4% were malignant. Cats and horses were represented by 7 and 3 cases respectively. Two monkeys and a parakeet were also represented.

In dogs of both sexes the most common malignant neoplasm was the squamous cell carcinoma of the skin followed closely by lymphosarcoma (Table I). Mammary gland tumors were third in order of incidence (Figure 2).

Most benign canine neoplasms also were in the skin, with perianal gland adenoma second in occurrence, and tumors of the connective and soft tissues (mostly lipomas) third (Figure 3). Of the skin tumors, mast cell tumors had the highest incidence (ten), while sebaceous adenoma, histiocytoma and epidermal inclusion cyst were second with seven each (Table I).

In cats there were three benign neoplasms (keratoacanthoma, mammary adenoma and a multiple osteochondroma) (4) and four malignant tumors (adenocarcinoma from an undetermined site, squamous cell carcinoma of the ear, lymphosarcoma of the kidney, and leiomyosarcoma of the uterus). The three equine accessions included two fibromas (sarcomas) and one thyroid adenoma. One rhesus monkey had malignant lymphoma (3), the other had a neurofibroma of the myocardium. One parakeet with a papilloma was recorded.

DISCUSSION

Completeness of reporting is an important ingredient in cancer morbidity studies. The age and sex of the animal was available in less than half of our cases. All contributions to pathology laboratories should include information as to sex, species, breed, weight, color, and whether spayed or castrated. Other valuable information should answer the questions: Have the female animals ever given birth to young, and if so how many, is the dog AKC registered, is the animal kept indoors, when was the neoplasm first noticed, and was the neoplasm suspected to be malignant or benign at surgery.

While there has been no report of the incidence of human cancer in this study area, it is probable that such incidence is typical of the United States. A few comments about the incidence of cancer in animals and man can be made from other studies. Dorn pointed out that domestic animals do not often develop gastrointestinal malignancies, which are common in man (5,7,8). He also suggested that the high number of skin tumors in the dog, in relation to internal tumors, may be due to under reporting resulting from infrequent necropsies, while in man autopsies are a common procedure.

Special consideration should be given to canine lymphosarcoma. Recent work on lymphosarcoma in cats, cattle, poultry, rodents and nonhuman primates suggest a viral etiology. In the Northwest Florida study area, canine lymphosarcoma in both sexes accounted for 8.8% of all tumors. In Dorn's California animal cancer study, the percentage of lymphosarcoma was 4.7% in female dogs and 6.8% in male dogs. Moulton

placed the incidence of lymphosarcoma at 0.3% in the canine population (7). The observed occurrence of canine lymphosarcoma in Northwest Florida may reflect greater general practitioner interest in this disease, or it may actually occur with greater frequency than in other areas. Whether this implied increase in canine lymphosarcoma would be reflected in the human population awaits a similar study in man.

SUMMARY

A four and one-half year survey of spontaneous neoplasms in animals was conducted in Northwest Florida, for the most part in Escambia and Santa Rosa counties. Veterinarians in these counties contributed cases to a registry of comparative pathology at the Naval Aerospace Medical Research Laboratory, Pensacola, Florida. In return for the tumor contributions, the veterinarians received histopathologic diagnoses. During the four and one-half years of reporting, 150 newly diagnosed neoplasm cases (59 malignant and 91 benign) were recorded. Of all the neoplasms, 137 were from dogs, 7 were from cats, 4 were from other domestic animals, and 2 were from laboratory monkeys. In dogs 39.4% of all neoplasms were malignant. Squamous cell carcinoma was the most common malignancy. The next most common malignancy in dogs was lymphosarcoma. This disease comprised a greater proportion of malignant neoplasms of dogs than in the California study. The skin, including the subcutis, was the most common anatomic site of all canine tumors.

Table I

Number of Malignant and Benign Neoplasm Cases Newly Diagnosed
Among Dogs in Northwest Florida, July 1968 to February 1973

<u>Malignant</u>		<u>Benign</u>	
Squamous cell carcinoma	13	Perianal gland adenoma	12
Lymphosarcoma	12	Mast cell tumor	10
Mammary adenocarcinoma	8	Sebaceous adenoma	7
Hemangiosarcoma	4	Histiocytoma	7
Adnexal carcinoma	2	Epidermal inclusion cyst	7
Adenocarcinoma, site undetermined	2	Mixed mammary tumor	7
Liposarcoma	2	Lipoma	7
Malignant mast cell tumor	2	Hemangioma	3
Malignant melanoma	2	Keratoacanthoma	3
Adenocarcinoma, intestine	1	Basal cell tumor	2
Adenocarcinoma, skin	1	Hemangiopericytoma	2
Fibrosarcoma	1	Leiomyoma	2
Endocrine tumor	1	Papilloma	2
Chondrosarcoma	1	Pseudoepithelomatous hyperplasia	2
Osteogenic sarcoma	1	Sertoli cell tumor	2
Undifferentiated sarcoma	1	Trichoepithelioma	2
		Chondroma	1
		Adrenal adenoma	1
		Calcinosis circumscripta	1
		Fibroma	1
		Interstitial cell tumor	1
		Transmissible venereal tumor	1

Total all sites, malignant and benign 137

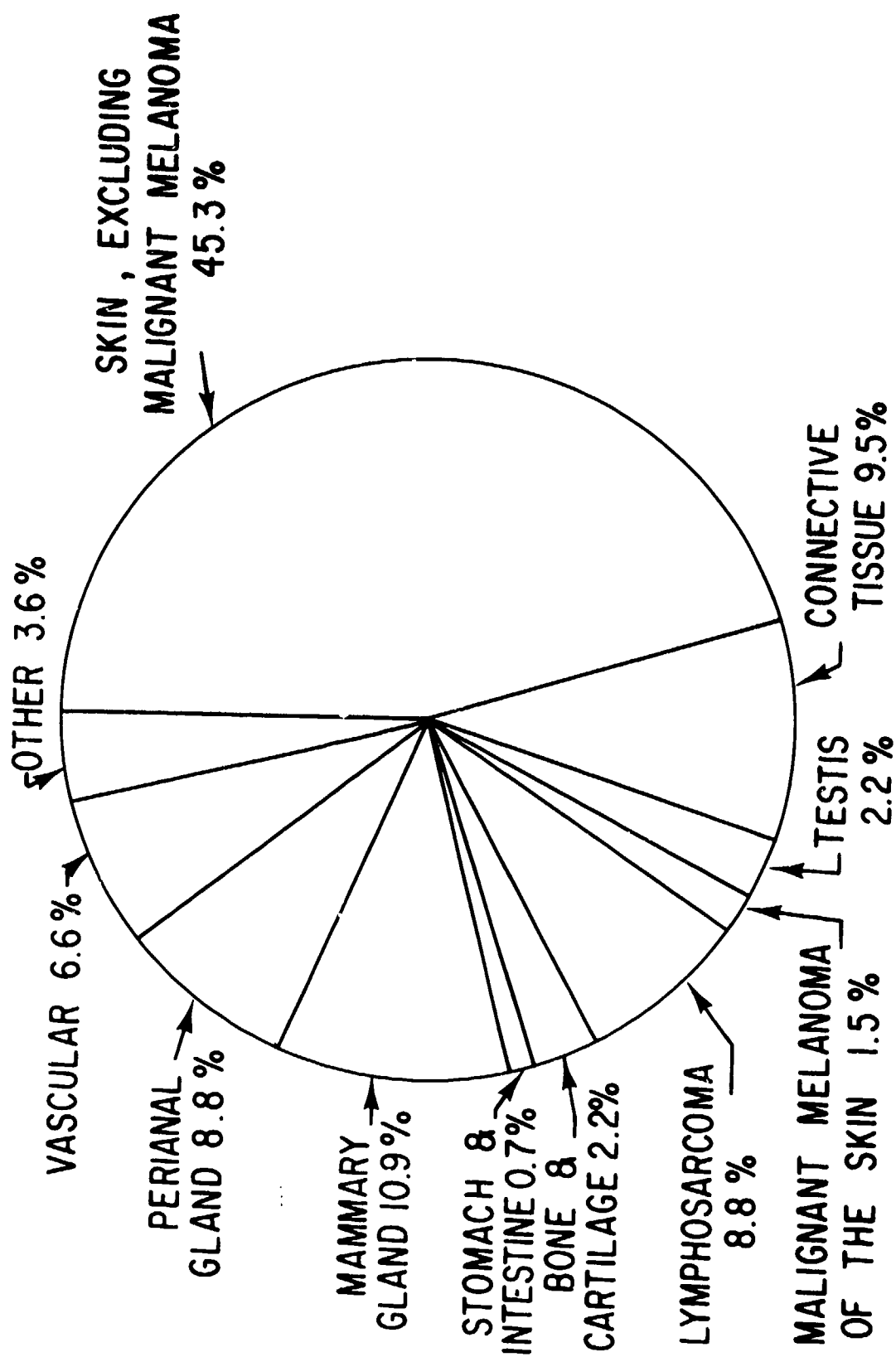


Figure 1

Benign and malignant cancer sites in dogs in Northwest Florida
July 1968 - February 1973

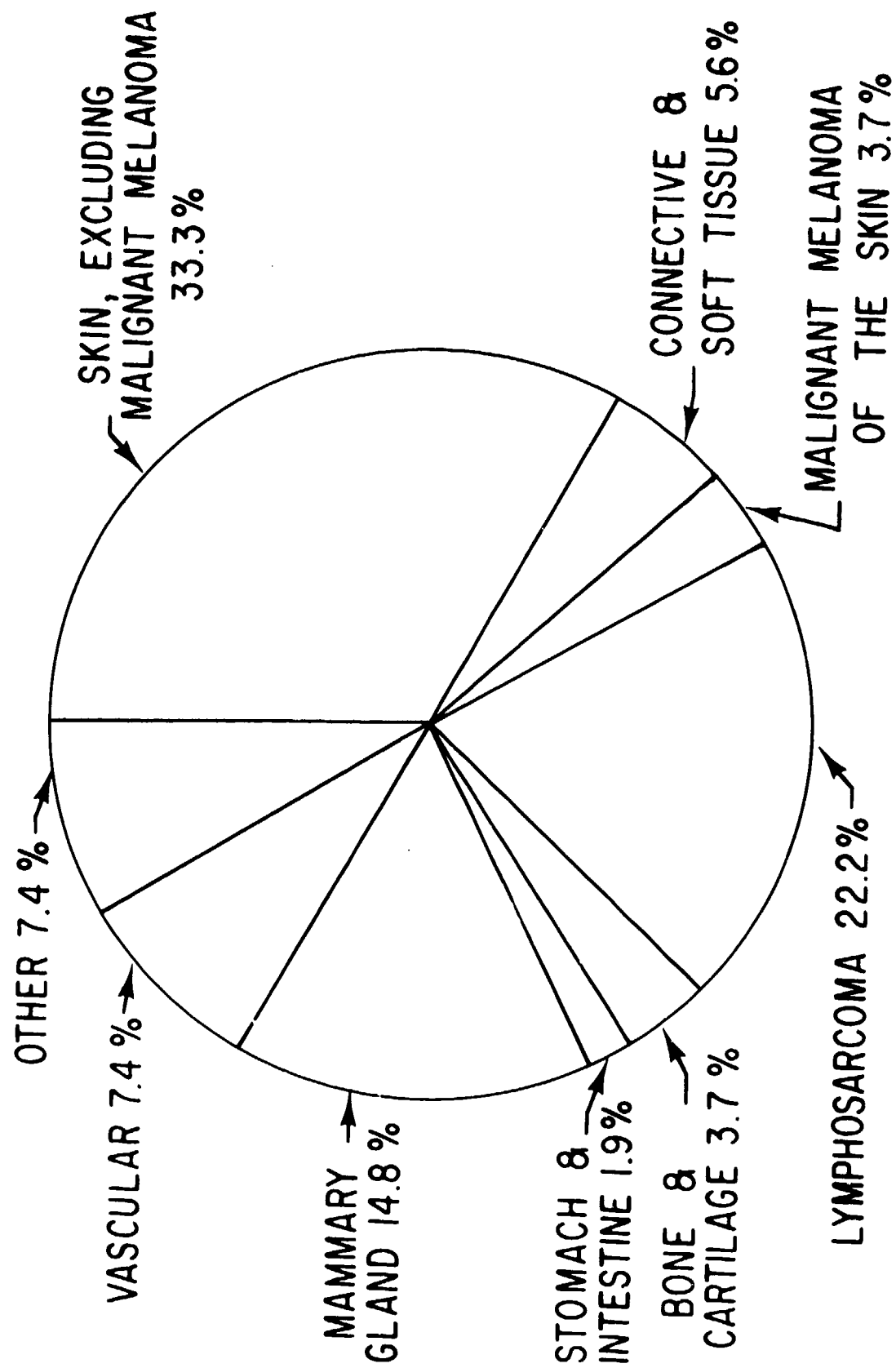


Figure 2

Sites of malignant tumors in dogs in Northwest Florida
July 1968 - February 1973

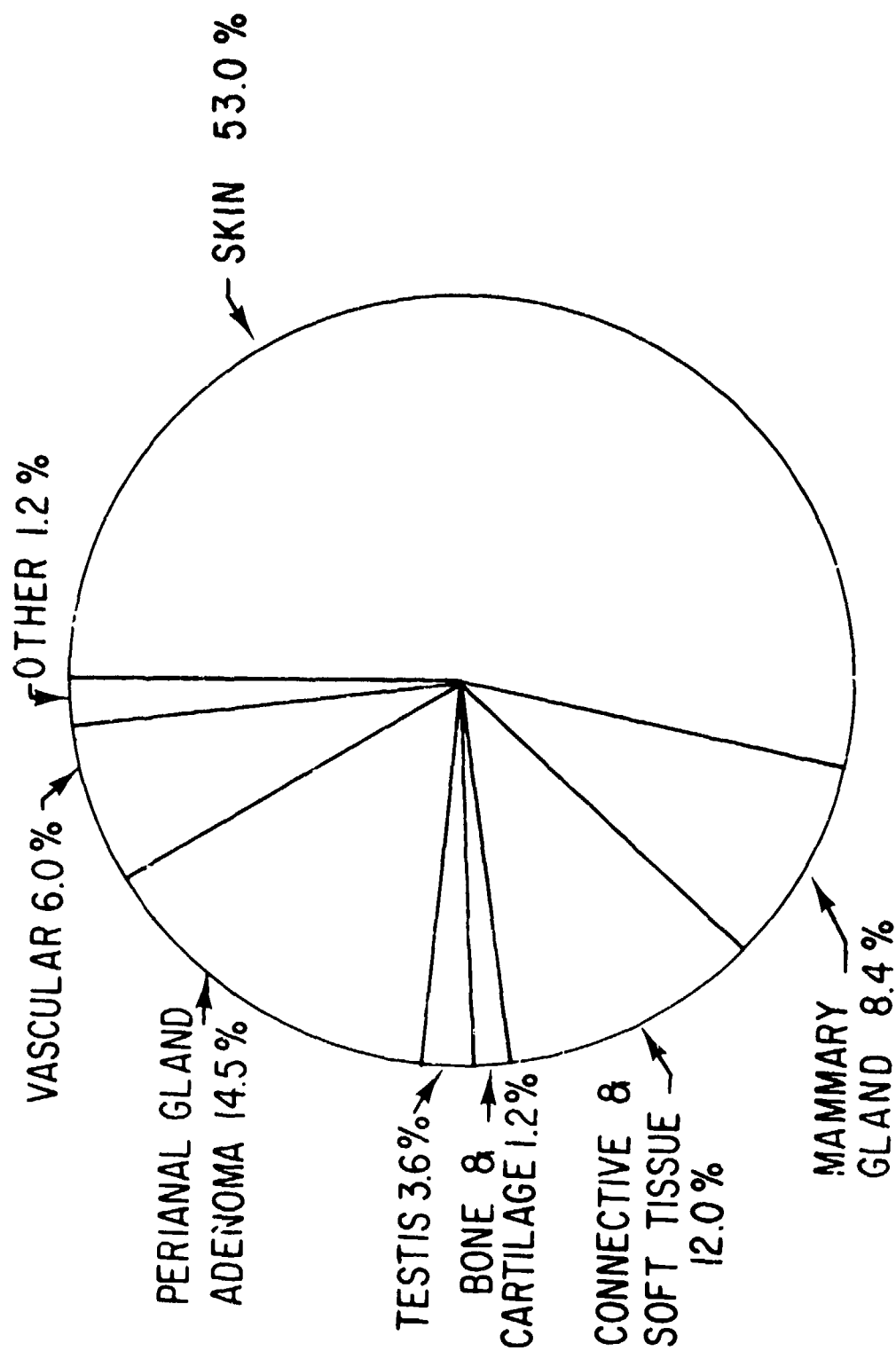


Figure 3

Sites of benign tumor in dogs in Northwest Florida
July 1968 - February 1973

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